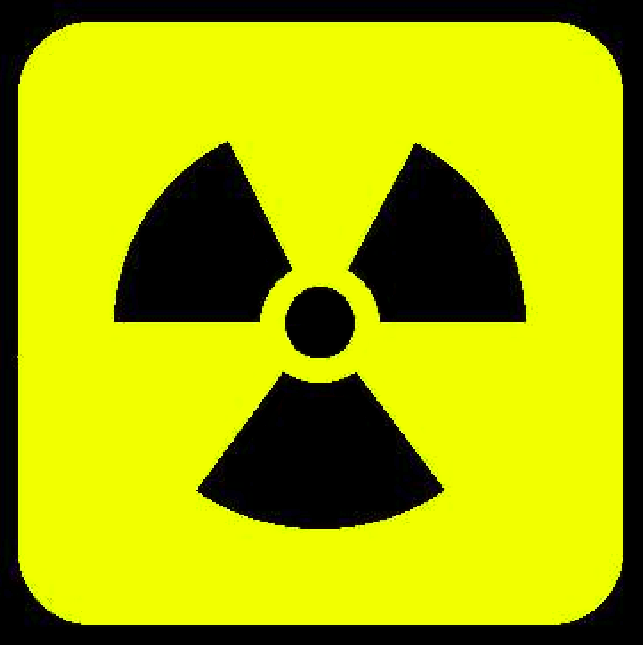
Period: Date: Name:

**Solar Interior/Nuclear Fusion**

I. Solar Interior

A. The sun, like all stars, is powered by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in its core.

B. The specific nuclear reaction that occurs in the sun involves converting \_\_\_\_\_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

C. Core temperatures: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

i. At such high temperatures, gas is completely ionized, containing free moving protons and electrons.

ii. Protons are positively charged and \_\_\_\_\_\_\_\_\_ each other electrically at close range; however, at T > 10 Million K, proton speeds can be ­­­­\_\_\_\_\_\_\_ enough to overcome electrical repulsion, and undergo a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Colliding Protons:**

\*If temperatures are high enough, protons can be “slammed” together resulting in protons that are “stuck” together, bounded by a “strong nuclear force” which overcomes electrical repulsion.

II. Nuclear Fusion

A. Mechanism: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: Four protons (hydrogen nuclei) slam together in several steps to yield a helium nucleus (2 protons, 2 neutrons) plus energy in the form of gamma rays.

B. Reactions:

C. Energy Production

i. Mass of resulting ­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (4.003 AMU) is slightly less that the mass of the original 4 Hydrogen atoms (4.0032 AMU). Difference of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_AMU.

ii. Missing mass was converted directly to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and emitted, in amounts according to Einstein’s equation:

iii. Because the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is very great (3x108 m/sec), the amount of energy released from even a small amount of mass is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

iv. Each nuclear fusion reaction that takes place (on an atomic level) in the core produces a very \_\_\_\_\_\_\_\_\_\_\_\_ amount of energy, not even enough energy to raise a housefly \_\_\_\_\_\_\_\_\_ inches. But, \_\_\_\_\_\_\_\_ of these reactions in the core convert 5 million tons of mass to energy \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!!!!!

v. The energy produced in the form of gamma rays is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by surrounding gas, which heats up, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and helps maintain the sun’s outward \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. If fusion in the core were to stop, the force of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ would overcome the outward force of pressure and the sun would \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ inward on itself.

III. Solar Fate

A. Enough fuel to last another \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ years.

B. At its present state, the sun will last for another \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ years before it will grow dramatically and engulf the Earth and other planets.